

# Distribution Incentive System (DIS)

# The Research Problem & Situation



- Focus is on detailer or “matchmaker”...not sailors or commands
- Involuntary assignments
- Commands are largely excluded
- Fairly static wage structure

# Why an Auction Not Fixed Incentives



## Sailor Preference Heterogeneity Across Billets

- Benefits Sailors
  - Bids offer Sailors a means to affect their next assignment
- Benefits Navy
  - Identifies the Sailor who least dislikes an undesirable job



# Why Are Auctions Used?

- **Efficient price discovery mechanism when value is unknown**

Treasury Securities

Antiques

3G Mobile Phone Licenses

# Auction Literature: Lessons from Previous Research



## Why Sealed Bid

- Limited connectivity – equity issues
- Sealed bids make collusion more difficult (Klempner)
- If lack of competition is a concern then a sealed bid approach is preferable (Klempner)

# Overview of Proposed Auction Process

- › Navy determines eligibility criteria and scoring rule
  - Aggregate Fitness Score =  $fn(moving\ \$, skill\text{-}match, Sailor\ input, command\ input, gap/overlap\ldots)$
- › Navy determines which billets are eligible for incentives
- › Sailor bids/applies for jobs
  - Sailor inputs bid or selection score for job
- › Commands provide input as to which Sailors they prefer
- › Detailer creates assignment slate based on Aggregate Fitness Score

# US Navy

## Distribution Incentive System



USER ID:

PASSWORD:

Login

DIS Demonstration Release 0.0

© 2002 EDS Corp. ALL RIGHTS RESERVED.

This material may be reproduced by or for the U.S. Government pursuant to  
the copyright license under the clause at DFARS 252.227-7031 (Oct 1988).

Trademarks, Product or Service names, used or referenced, are trademarks or service marks of their respective manufacturers.

Company names used herein are trademarks or trade names of their respective companies or organizations.



## NPRST DIS Demo

You are logged in as: Test AIA

Role: AIA



## Set Scoring Weights

## Scoring Rule - Auction - AllNavy\_6Dec2002

Navy MOEs: 60

Biddable Attributes: 30

Command Subsidy: 10

Assign Weights by:

- Manual
- Tool 

Save as Default: **Save****Cancel**



## NPRST DIS Demo

You are logged in as: Test AIA

Role: AIA



## Select Navy MOEs

Auction - AllNavy\_6Dec2002

Select/Un-Select MOEs using horizontal arrows.

## Available MOEs

Gap/Overlap  
PaygradeMatch  
RequisitionPriority  
NECReutilization

## Selected MOEs

PCSCost  
On-TimeArrival  
SkillMatch

Save as Default: 

Save

Close



## NPRST DIS Demo

You are logged in as: Test AIA

Role: AIA



## Set Weights for Navy MOEs

Enter the Weights for the MOEs: Auction - AllNavy\_6Dec2002

PCSCost 20

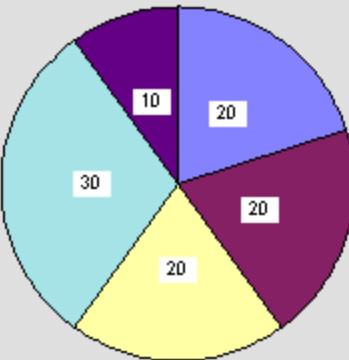
On-TimeArrival 20

SkillMatch 20

View

The Scores should Sum to 60

## Distribution Graph



- PCSCost
- On-TimeArrival
- SkillMatch
- Biddable Attributes
- Command Subsidy

Save

Cancel



## NPRST DIS Demo

You are logged in as: Test AIA

Role: AIA



## Set Weights for Navy MOEs using APMS

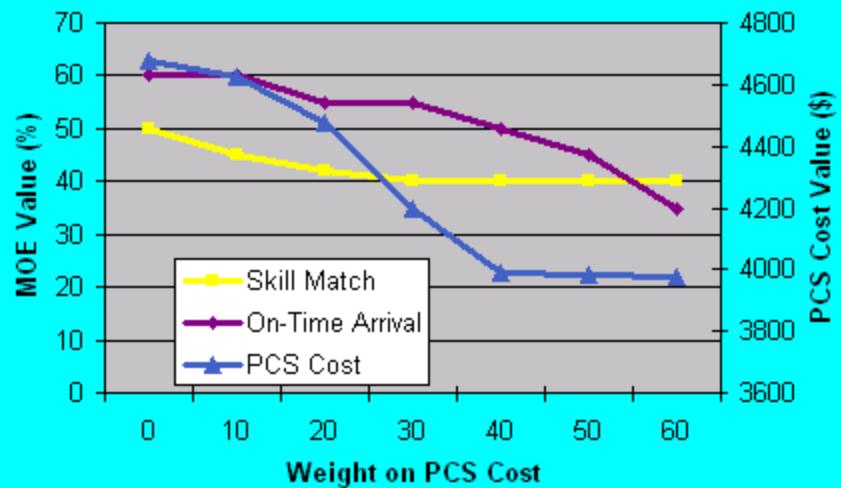
What-if Analysis: Auction - AllNavy\_6Dec2002

MOE	MAX	MIN	VALUE	WEIGHT
PCSCost	9552	3978	4003	20
On-TimeArrival	75	0	50	20
SkillMatch	50	10	50	20

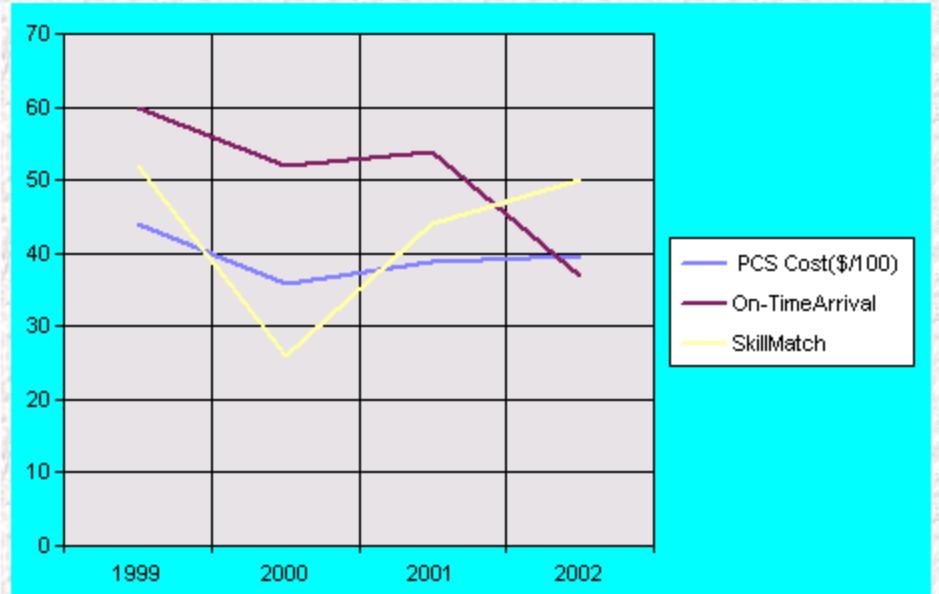
MOE	Value / Wt (1)	Value / Wt (2)
PCSCost	4472 / 20	3978 / 30
On-TimeArrival	62 / 20	37 / 10
SkillMatch	42 / 20	50 / 20

## Trade-Off Graphs of MOEs

Trade-Off PCS Cost Weight



## Compare Past performance with this auction



Save

Cancel



## Set Weights for Biddable Attributes

Enter the Weights for the Biddable Attributes: Auction -  
AllNavy\_6Dec2002

AIP(MonthlyBonus)

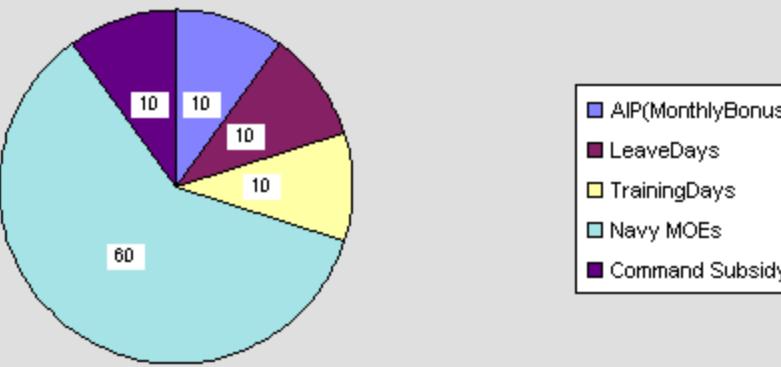
LeaveDays

TrainingDays

**View**

The Scores should Sum to 30

### Distribution Graph



**Save**

**Cancel**



## Set Maximum Bid

### Define Maximum Bid Rules: Auction - AllNavy\_6Dec2002

**Decide Maximum Bid Using**

Tool  
 Manual

[View/Edit Rules](#)**Notify Sailors of Reservation Wages ?**

Yes  
 No

**How to treat bids above Reservation Wages ?**

Penalize  
 Disallow

[Specify](#)

### Select Job to Edit Bid Limits

Activity	Rate	Paygrade	Priority	TUM	Sea/Shore Code
NCMOC BAHRAIN	AG3	E-4	015	9/15/2003	3
<b>NCMOC BAHRAIN</b>	<b>AG3</b>	<b>E-4</b>	<b>010</b>	<b>8/15/2003</b>	<b>3</b>
<b>NCMOC BAHRAIN</b>	<b>AG3</b>	<b>E-4</b>	<b>007</b>	<b>6/15/2003</b>	<b>3</b>
<b>NCMOC BAHRAIN</b>	<b>AGCS</b>	<b>E-8</b>	<b>001</b>	<b>7/15/2003</b>	<b>3</b>
NEMOF NAPLES	AGCS	E-8	002	12/15/2002	3
<b>NLMOD KEFLAVIK</b>	<b>AGCS</b>	<b>E-8</b>	<b>001</b>	<b>7/15/2003</b>	<b>3</b>
NLMOD KEFLAVIK	AG2	E-5	011	9/15/2003	3
<b>NLMOD KEFLAVIK</b>	<b>AG2</b>	<b>E-5</b>	<b>010</b>	<b>9/15/2003</b>	<b>3</b>
NCMOD D GARCIA	AG2	E-5	012	9/15/2003	3

### Job Details

**Select a job to View Details****Maximum Bids: Budget Pro Rata**

AIP (MonthlyBonus)	500	30000	250
LeaveDays	0	240	10
TrainingDays	4	420	4

[Finish](#)

# US Navy

## Distribution Incentive System



USER ID:

PASSWORD:

**Login**

DIS Demonstration Release 0.0

© 2002 EDS Corp. ALL RIGHTS RESERVED.

This material may be reproduced by or for the U.S. Government pursuant to  
the copyright license under the clause at DFARS 252.227-7031 (Oct 1988).

Trademarks, Product or Service names, used or referenced, are trademarks or service marks of their respective manufacturers.

Company names used herein are trademarks or trade names of their respective companies or organizations.



## NPRST DIS Demo

You are logged in as: Test Command

Role: Command



Requisition Cycle: 6-Dec-2002

Activity	Paygrade	Rate	Priority	TUM	SeaShoreCo
NLMOD KEFLAVIK	E-6	AG1	001	6/15/2003	3
NLMOD KEFLAVIK	E-6	AG1	002	9/15/2003	3
NLMOD KEFLAVIK	E-6	AG1	003	9/15/2003	3
NLMOD KEFLAVIK	E-6	AG1	004	9/15/2003	3
► NLMOD KEFLAVIK	E-8	AGCS	001	7/15/2003	3

Subsidy points allocation for this cycle: 60

Points used this cycle: 10

Job	Priority	Sailor Name	Subsidy
AGCS	001	-----	8
AGCS	001	-----	1
AGCS	001	-----	1

Job: AGCS-P-3-YY1433 -001-0-0

 Tool  Go Manual

Max Subsidy per Sailor (this Job):

10 points

Name	Navy Score	Will Bid?	SeaShore	Rate	PRD	Subsidy
Sailor 1	58	Y	2	AGCS	6/15/2003	0
Sailor 2	40	Y	2	AGCS	7/15/2003	0
Sailor 3	36	N	2	AGCS	9/15/2003	10
Sailor 4	35	Y	6	AGCS	3/15/2003	8
Sailor 5	33	N	2	AGCS	12/15/2002	5
Sailor 6	33	Y	2	AGCS	5/15/2003	1
Sailor 7	27	Y	6	AGCS	2/15/2003	1

Measure	Weight	Value	Score
PCSCost	20	2353	18
On-TimeArrival	20	1	20
SkillMatch	20	1	20
<b>Total Navy Score</b>	<b>60</b>		<b>58</b>
<b>Command Subsidy</b>	<b>10</b>	<b>0</b>	<b>0</b>

Desired subsidy for this sailor for this job: 0

View Sailor e-Resumé

Save

Clear

# US Navy

## Distribution Incentive System



USER ID:

PASSWORD:

DIS Demonstration Release 0.0

© 2002 EDS Corp. ALL RIGHTS RESERVED.

This material may be reproduced by or for the U.S. Government pursuant to  
the copyright license under the clause at DFARS 252.227-7031 (Oct 1988).

Trademarks, Product or Service names, used or referenced, are trademarks or service marks of their respective manufacturers.

Company names used herein are trademarks or trade names of their respective companies or organizations.



## NPRST DIS Demo

You are logged in as: Jessica lamastus

Role: Sailor



## Sailor Makes/Reviews Bids

You are logged in as : Jessica lamastus

## My Jobs

	Rating	Activity	Location	TUM	Pref	Navy	Hot Job	Max bid	My bid		Make/Edit Bid
►	AGCS	<a href="#">NLMOC USJFCOM</a>	Ingleside, TX	7/15/2003			N	Rate from 0 to 30	30		<a href="#">No Bid</a>
	AGCS	<a href="#">NLMOD KEFLAVIK</a>	Keflavik, Iceland	7/15/2003				400 / 10 / 0	400 / 2 / 0		
	AGCS	<a href="#">NPMOC SAN DIEGO</a>	San Diego, CA	8/15/2003				Rate from 0 to 30	25		
	AGCS	<a href="#">NCMOC BAHRAIN</a>	Bahrain	7/15/2003				400 / 10 / 10	0 / 0 / 10		
	AGCS	<a href="#">NEMOF NAPLES</a>	Naples, Italy	12/15/2002				0 / 5 / 10	0 / 5 / 10		

[Submit](#)[Logout](#)



## NPRST DIS Demo

You are logged in as: Jessica Iamastus

Role: Sailor



## Sailor 'Make/Edit Bid'

## Bid Calculator

Job: NLMOC USJFCOM

My Personal Preference Score: 100

How my Score on this job has been calculated

Navy Measures:	Weight	My Value	My Score	Modify Bid
PCS Cost	20	1560	19	
On-Time Arrival	20	1	20	
Skill Match	20	1	20	59
<b>My Bid:</b>				
Preference Points	30	30	30	
Command Subsidy	10	35	0	30
<b>Total:</b>	<b>100</b>		<b>89</b>	OK



## NPRST DIS Demo

You are logged in as: Jessica lamastus

Role: Sailor



## Sailor Makes/Reviews Bids

You are logged in as : Jessica lamastus

## My Jobs

	Rating	Activity	Location	TUM	Pref	Navy	Hot Job	Max bid	My bid		Make/Edit Bid
	AGCS	<a href="#">NLMOC USJFCOM</a>	Ingleside, TX	7/15/2003				Rate from 0 to 30	30		<a href="#">No Bid</a>
►	AGCS	<a href="#">NLMOD KEFLAVIK</a>	Keflavik, Iceland	7/15/2003				400 / 10 / 0	400 / 2 / 0		
	AGCS	<a href="#">NPMOC SAN DIEGO</a>	San Diego, CA	8/15/2003				Rate from 0 to 30	25		
	AGCS	<a href="#">NCMOC BAHRAIN</a>	Bahrain	7/15/2003				400 / 10 / 10	0 / 0 / 10		
	AGCS	<a href="#">NEMOF NAPLES</a>	Naples, Italy	12/15/2002				0 / 5 / 10	0 / 5 / 10		

[Submit](#)[Logout](#)



## NPRST DIS Demo

You are logged in as: Jessica Iamastus

Role: Sailor



## Sailor 'Make/Edit Bid'

## Bid Calculator

Job: NLMOD KEFLAVIK

My Personal Preference Score: 100

How my Score on this job has been calculated

Navy Measures:	Weight	My Value	My Score	Modify Bid
PCS Cost	20	2353	18	
On-Time Arrival	20	1	20	
SkillMatch	20	1	20	58
<b>My Bid:</b>				
AIP (Bonus / month)	10	\$400	0	
Training Days	10	2 pts	8	
Leave Days	10	0 days	10	
Command Subsidy	10		0	18
<b>Total:</b>	<b>100</b>		<b>76</b>	<b>OK</b>



## NPRST DIS Demo

You are logged in as: Jessica lamastus

Role: Sailor



## Sailor Auction Results Review - Assignment

You are logged in as : Jessica lamastus

You have been assigned to a new job!

Taking into account your bids and the Navy's needs, you have been assigned to the following job:

Job Details

Activity	NLMOC USJFCOM
Rate	AGCS
TUM	7/15/2003
MCA	BUPERS
Duty Type (SSC)	1
Location (Base)	ING (Ingleside, TX)

**Job Details**My Bid

*(Unless otherwise noted, this bid has been awarded to you as your incentive package)*

## List of Unawarded Jobs

Activity	Paygrade	TUM	My bid	Navy Base Score	Navy Score with Bid	Best Score
NCMOC BAHRAIN	E-8	7/15/2003	0 / 0 / 10	59	79	79
NPMOC SAN DIEGO	E-8	8/15/2003	25	38	62	62
NEMOF NAPLES	E-8	12/15/2002	0 / 5 / 10	35	45	65
NLMOD KEFLAVIK	E-8	7/15/2003	400 / 2 / 0	58	76	76

**Logout**

# US Navy

## Distribution Incentive System



USER ID:

PASSWORD:

DIS Demonstration Release 0.0

© 2002 EDS Corp. ALL RIGHTS RESERVED.

This material may be reproduced by or for the U.S. Government pursuant to  
the copyright license under the clause at DFARS 252.227-7031 (Oct 1988).

Trademarks, Product or Service names, used or referenced, are trademarks or service marks of their respective manufacturers.

Company names used herein are trademarks or trade names of their respective companies or organizations.



## NPRST DIS Demo

You are logged in as: **Test Detailer**Role: **Detailer****Review Auction Results: Recommended Assignments**

Assignments: 8 Total Score: 477

**Recommended Matches**

Name	Activity	Total Score	Trng?	Paygrade(J)	SeaShoreCode	TUM	Priority	Paygrade(S)	Actions
LAMASTUS JESSICA	NLMOC USJFCOM	89	N	E-8	1	7/15/2003	002	E-8	
MCKAY JEFFERY	NLMOD KEFLAVIK	70	N	E-8	3	7/15/2003	001	E-8	
KESTENBAUM TRENT	NAVLANTMETOCEN	60	N	E-8	1	9/15/2003	003	E-8	
SMALL RIKKI	NPMOC YOKOSUKA	56	N	E-8	6	7/15/2003	003	E-8	
DONEY LORI	NEMOF NAPLES	56	N	E-8	3	12/15/2002	002	E-8	
HOBART SOO	NCMOC BAHRAIN	51	N	E-8	3	7/15/2003	001	E-8	
SLOWDEN TAMEKA	NPMOC SAN DIEGO	48	N	E-8	1	8/15/2003	002	E-8	
MCNULTY JAMES	NAVPACMETOCEN	47	N	E-8	1	12/15/2002	001	E-8	

**Bid Details**

Measure	Weight	Value	Score
PCSCost	20	1560	19
On-Time Arrival	20	1	20
SkillMatch	20	1	20
<b>Total Navy Score</b>	<b>60</b>		<b>59</b>
SailorPreference	30	30	30
<b>Total Bid Score</b>	<b>30</b>		<b>30</b>
Command Subsidy	10	0	0

**Sailor Details****Alternative Jobs****Job Details****Alternative Sailors****Confirm Match****Save****View Unassigned****View Matches****Confirm Slate****Cancel**

**End**



# S&T Research: Functionality & Business Rules



## Research and Test Enhancements to Sea Warrior CMS

- › Multi-Attribute Auction Design
  - Sailor tradeoffs across alternative incentives
- › DST to aid determination of optimal auction parameters
- › Develop methodologies to flag “hard-to-fill” jobs early
- › Enhanced command input methodology
- › Develop Algorithms for Cross Billet Optimization DST
- › Methods for Sailors to Express Preferences for non-auction billets
  - Must allow optimization across all billets

# Efficiency & Auction Design Research



## S&T Gaps affecting auction efficiency - DIS Research

- › Bid Weight & Bid Inflation
- › Collusion & requisition cycle length
- › Effect of one win only rule on bid structure
- › Effect of bid ceilings on bid structure



# Why a Multi-Attribute Auction?

## Sailor Preference Heterogeneity Across Alternative Incentives

- Benefits Sailors
  - Allows them to tailor their incentive package
- Benefits the Navy
  - Identifies the least cost combination of incentives for each Sailor

# Alternative AIP Allocation Methodologies



Literature Review Informs Market Driven Design

- › Four Basic Types of Auctions
  - English Auction;
  - Dutch Auction;
  - First Price Sealed Bid (FPSB);
  - Second Price Sealed Bid (SPSB).
- › Revenue Equivalence
  - Breaks down with risk averse bidders (Harris and Raviv)

# Auction Literature: Lessons from Previous Research



## Why First Price Auction

- With risk averse bidders FPSB auctions perform better than English or SPSB auctions (Harris and Raviv, and Riley and Samuelson)
- FPSB auctions are susceptible to auctioneer cheating (Klempner)
- Easier to implement with a scoring rule